

CLAIMS

We claim:

1. In a manually operable switch having an operating handle movably mounted on the housing for moving a set of contacts in the housing from one position to another, the improvement comprising:

a force generating arrangement mounted outside the switch housing; and

5 a force translation system extending between the housing and the force generating arrangement and having a first end structure movable into and out of contact with the operating handle and a second end structure disposed for movement in the force generating arrangement.

2. The improvement of claim 1, wherein the force generating arrangement is selected from the group consisting of an electromagnetic solenoid, a wax motor, a linear actuator, a shaped memory effect (SME) actuator, a servo motor, a stepper motor, a pneumatic cylinder, a hydraulic cylinder, and a piezoceramic actuator.

5 3. The improvement of claim 1, wherein the force translation system is comprised of a pair of elongated plungers.

4. The improvement of claim 1, wherein a control structure is operably connected to the force generating device outside the housing.

5. A switch comprising:

a housing having wall structure formed with at least one throughbore, and an operating handle pivotally mounted to the wall structure for manually moving a set of contacts in the housing from one position to another;

5 a force generating device disposed externally of the housing; and

at least one plunger movably mounted in the throughbore and having one end engageable with the operating handle and an opposite end engageable with the force generating device.

6. The switch of claim 5, wherein the housing has a lower section removably attached to an upper section.

7. The switch in claim 6, wherein the wall structure of the housing lower section has a length and a height, the throughbore being formed along substantially the entire height of the wall structure of the housing lower section.

8. The switch of claim 5, wherein the housing is suspendedly mounted in a support panel.

9. A manually operable switch which may be removably actuated comprising:

a housing mounted in a support panel and having wall structure formed with a pair of spaced apart throughbores, and an operating handle with opposed ends pivotally mounted to the wall structure for moving a set of contacts from one portion to another, the opposed ends of the operating handle being aligned with the throughbores;

a pair of force generating devices mounted exteriorly of the housing on a support structure;

10 a pair of elongated plungers disposed for reciprocal movement in the throughbores, each plunger having a first end movable into and out of contact with one end of the operating handle, and a second end disposed for movement in one of the force generating devices; and

15 a control structure disposed outside the housing and operably connected to the force generating devices to control actuation and deactuation thereof so as to move the plungers in a manner which will remotely pivot the operating handle.

10. The switch of claim 9, wherein the force generating devices are located beneath the housing.

11. The switch of claim 9, wherein the control structure is comprised of a controller, a receiver and a transmitter, all interconnected together.

12. A method of converting a manually operable switch to a remotely actuated switch, the switch having an operating handle movably mounted in a housing for moving a set of contacts from one position to another, the method comprising the steps of:

5 forming the housing with a pair of throughbores in alignment with opposite ends of each operating handle;

providing a pair of force generating devices mounted outside the housing, each of the force generating devices having a plunger movably mounted therein with a first end receivable in one of the throughbores and movable into and out of engagement with an end of the operating handle, and a second end disposed for movement in the force generating device;

10 inserting the plunger into the throughbores in the housing; and

selectively actuating the force generating device so as to effect remote movement of the operating handle.